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HANDBOOK OF PRACTICAL WORK IN GEOGRAPHY

FOR TEACHERS OF PLUS TWO STAGE

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S.C.E.R.T., West Bengal
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NCERT

राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्
National Council of Educational Research and Training

April 1984
Vaisakha 1906

P.D. 1 T—DPS

S.C.E.R.T., West Bengal
Date 14/12/84
Acc. No. 3080

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Price : Rs 6.20

Published at the Publication Department by C. Ramachandran, Secretary, National Council of Educational Research and Training, Sri Aurobindo Marg, New Delhi 110016 and printed at Mayur Press, 27, D.L.F. Industrial Area, Najafgarh Road, New Delhi 110015

Foreword

This handbook is a companion volume to go with the Council's textbook entitled 'Field work and Laboratory Techniques in Geography' meant for teaching practical work in the subject at the higher secondary stage. Such advanced level work found a place in Geography curriculum developed for classes XI and XII for the first time. It was considered necessary that a theoretical study of Geography should be enriched by practical work in the laboratory and the field to understand properly the tools and methods of learning Geography as a discipline. The teachers should be helped to analyse the contents and follow the underlying concepts through a series of practical work.

The inspiration to pursue the project and to complete it successfully came from the teachers of schools, colleges and the universities who participated in two workshops organised at Jabalpur in July-August, 1980 and at Kodai Kanal in July, 1981.

The contents of the textbook were discussed threadbare and the handbook for use by practising teachers was prepared providing guidelines, additional explanatory material and different methods for covering it more effectively.

The project required a good deal of spade work for preparation of the handbook and for getting good results of what was done in the two workshops. It would not have taken its present shape without follow-up by way of thorough editing and finalization of the instructional material. For all this I am thankful to my colleagues in the Department of Education in Social Sciences and Humanities, headed by Prof. B.S. Parakh. I am particularly thankful to Dr. K.L. Joshi, Reader in Geography and Shri D.P. Gupta, Research Associate in Geography for their sustained effort in this work.

A word of thanks also to the teachers who contributed to the preparation of the handbook. Our labours will be well rewarded if it goes to improve the teaching and learning of Geography through the indoor and outdoor practical work. Any suggestions towards the improvement of this handbook would be most welcome.

SHIB K. MITRA
Director
National Council of Educational
Research and Training

New Delhi
7 December 1981

A Word to the Teacher

This handbook is meant for use by the teachers. It is essential that they should find out the rationale and the design adopted for laying down the format employed in preparing the guidebook. It will help the teachers in understanding the framework in which they should attempt to cast the teaching of practical work in Geography. It also suggests what needs to be highlighted during laboratory and the field work in the subject.

While preparing the handbook, we came across several statements and exercises which need more explanation and additional questions. The gaps have been filled up under different heads within obvious limitations. The discussion groups during the workshops also felt the need of simpler and additional illustrations at a number of places. There was a plan to make it an illustrative handbook. But because of numerous constraints, the idea had to be abandoned. Still the teachers are advised to refer to Council's earlier book entitled 'Practical Geography—A textbook for Secondary Schools' last published in 1970 while using the present book. References to L. R. Singh's well-known book on 'Elements of Practical Geography' and to Monkhouse's 'Maps and Diagrams' are recommended. A workbook accompanying this publication has also been brought out by the National Council. It is helpful in giving greater practice to the young scholars.

The three components on elements of map making and projections, map interpretation, cartographic and quantitative methods can be taught indoors by giving exercises as we do during the course of Science experiments conducted in laboratories. The map making, learning the principles of land surveying, observation and recording of the local weather and carrying on field work for an investigation project are largely outdoor practical exercises. It is better if during each academic term there is a fair mix of indoor and outdoor work in practical Geography for the sake of sustaining learner's interest in it.

It is our feeling that full-throated lectures or long notes need to be avoided in order to make these the really 'doing exercises' for the young scholars. The teacher's role should rather be barely instructional before taking up a practical exercise and observational while it is being done by the students. Necessary follow-up can be undertaken by pointing out the possible correlation between learning theory lessons and doing practical exercises. There are a lot of meeting grounds and both the courses can benefit by mutual give and take. A viva-voce through short questions on the practical work done by an individual student is proposed as another form of follow-up.

With this much from our side, we leave it to the practising teachers to make best use of this first guidebook of its type prepared on practical aspects of a teaching subject. The much of the contents included in this publication have emerged out of discussions with, by and for the teachers during the two workshops. We hope that should make the hints and suggestions largely of practical value for classroom teachers.

K. L. JOSHI
Reader in
Geography

Acknowledgement

The NCERT and the academic staff working in the subject of Geography of Department of Education in Social Sciences and Humanities are indebted to the following Resource Persons, teacher participants and the Heads of institutions for contributing in the preparation of this publication :

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4. Prof N. Anantapadmanabhan, Dy. Director of Collegiate Education, Tamil Nadu, Madras.
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6. Dr. Umesh Chandra Tripathi, Lecturer M.L.B. Arts and Commerce College, Gwalior.
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8. Shri Yash Pal Singh, I/C Geography Programme, School T.V. Branch, Directorate of Education, New Delhi.
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Background Working Paper

The Background

The NCERT's textbook provides adequate material for field work and practical exercises in Geography at the plus two stage when student's base needs to be deepened and broadened in the subject. Needless to say that we can't appreciate the nature of Geography, its objectives and methodology without learning map skills. The techniques of cartography and field work have a great significance as they are tools of learning Geography and instrumental in teaching it effectively.

The present book is an addition to the Council's earlier book on Practical Geography.

The course covered in this book has four units spread over all the four semesters in which the plus two stage was originally divided. These are as follows :

- (i) Elementary Surveying and Map-making. It includes maps and their classification—projections-elementary chain and plane table surveying—scales—directions—map symbols—methods of showing relief - weather instrument - Isotherms and Isohytes—cartographic techniques.
- (ii) Map Reading - Study of representative Survey of India topographic sheets - understanding weather maps.
- (iii) Field work and Local Surveys—Problems and techniques.
- (iv) Processing of data and thematic mapping—techniques, tabulation and condensation of data-statistical techniques.

Out of 16 units of the syllabus of plus two stage, 4 pertain to practical work and 8 out of 24 credits are reserved for it.

The inclusion of practical geography and mapwork in the course is meant to help develop interest among students in the way the geographers work in the field, collect data, process and depict them on a map and interpret them. Thus a brief introduction in a functional way to the cartographic and quantitative methods used in Geography should be found both useful and interesting. It aims at familiarising the students with the sources of secondary data, collecting information from them and arriving at meaningful conclusions through various techniques and methods, both cartographic and statistical.

The framers of the syllabus hoped that this approach to teaching of Geography at this stage would be found useful for

- (i) those offering the subject at the university level and also by others who might offer allied subjects or enter into related professions or occupations.
- (ii) realising the objectives of vocationalisation of education at this stage.
- (iii) furthering the idea of work experience advocated in the entire educational system under the new pattern.

Rationale and the aims

A very pertinent question which now arises is about the goals we set for the Handbook under consideration.

This Handbook concerns itself with the basic essentials of Practical Work in a way that teachers can make a meaningful use of it in their classes. It aims at highlighting the scope of the laboratory and field exercises in imparting map skills. It would be an attempt in making Geography enhance its position among field and laboratory sciences at this crucial bridge stage between the close of general schooling and the ensuing university education.

The book has been in use for the last 3 years and two-thirds of its contents have for long been included in the traditional syllabus of Practical Work in Geography for the under-graduate classes. For this reason we have our individual reactions to the nature of this work and might have developed contrivances to resolve some of the ticklish points. The Handbook may incorporate such useful and specific suggestions at their relevant places.

1.1 Can't practical Geography and map-work be visualized that each set of exercises and each series of skills in it are integrated with theoretical study of Geography? Each section in this textbook pertains to a corresponding aspect of theoretical Geography. How can we possibly make practical exercises as stepping stones to learn the subject of Geography most effectively?

1.2 Besides providing a digest of what is covered in the textbook, how can we focus its contents on what we observe, do and draw in Geography?

1.3 We can't altogether root out the importance of discussing the theoretical aspect of mapping and cartographic techniques. This Handbook should supply necessarily detailed theoretical information without padding. A carefully arranged methodical account supported with numerous short and businesslike questions on different chapters and a list of cross-references to additional readings for teachers may be our immediate purpose. Doesn't it mean that the Handbook may be something midway between what a textbook is? It should concern itself with teacher's viewpoint and his or her difficulties faced in making the book a working proposition in the classroom.

1.4 The long-range objective is to help the teachers make the learning of these techniques so functional and natural that it starts permeating the theoretical study of Geography.

1.5 Should we not find out the maximum number of meeting points between theoretical aspects of the subject in a bid to bridge up the apparent chasm between knowledge and skills learning?

Specific objectives

1. Identifying various problems in teaching map work and covering a course of practical work in Geography.
2. Finalisation of designs and format for all the four units and sub-units of the Council's textbook under discussion.
3. Preparation of a module on at least a chapter each on two to three units.

Drawing up the format—
Some assumptions and considerations

II.1 A format of a Handbook on any area of Geography has to be different from the present one on many grounds. It is 'doing' or 'skills learning' that is to be taken care of in a Handbook on Practical Work in Geography. Because this is a syllabus of practical work, it is much more difficult to be specific in suggestions. Each unit may demand an altogether different treatment. The teaching of a Practical Work is obviously different from that of a theoretical work. The emphasis has to be on splitting up long units and sub-units into self-contained small parcels in which the work is presented to the pupils each lasting only a few periods and designed to arouse curiosity and give satisfaction in itself; and of the practical nature of the work. In every period devoted to practical geography, each pupil will be working towards making or doing something himself or herself.

II.2 The major points or the key-notes in each working unit may have to be laid down at the start. It may be followed by sorting out the main components of its content. A brief and functional analysis of the contents may have to be carried out, pivotal or difficult points and the technical terms be made clear.

II.3 In the central part of the framework general hints for covering the practical exercises may be spelt out. A detailed break-up consisting of a series of small steps for an indoor laboratory exercise and of procedures for an outdoor field work will be our major concern. Needless to point out that these steps or procedures are to be arranged in a logical sequence, one following another so as to complete the exercise largely by self-doing by each pupil or a group of pupils, as the case may be.

For instance, while undertaking field work the various steps may be—mode and duration—pre-requisites for a successful study—what not to do—Identification of a problem—Deciding what information or data is needed—Preparation of questionnaire—Collection of data—Canvassing of a questionnaire—tabulation of data—structure of table schedules etc. The steps in a field survey pertain to 'when, where and what'. They may be varied depending on the nature of the survey as in the cases of a land—use survey, market, industrial or a traffic survey. Handling and learning the use of apparatus and meteorological instruments needs a careful guidance and various steps are to be spelled by a Geography teacher appropriate for such an exercise.

In an indoor exercise, for instance, while representing statistical data or interpreting topographic sheets, we should proceed as we do in solving a geometrical proposition in mathematics. We shall have to say what is given, what has to be interpreted, made or depicted on maps; and inventory of concrete steps to be followed by necessary precautions; the scheme of shades or of diagrams be decided; designing or layout of the diagram will be taken care of. The preparation should readily keep the learner in attempting an analysis or drawing out some conclusions. That will be the touchstone of a successful practical exercise.

II.4 In the concluding part of the format, we propose to include some extra illustrations or drawing in a bid to supplement what is already in the textbook. In Evaluation appended to each working unit, the number of questions, very short answer or objective type, need to be quite a large one. They should be so framed that a teacher may use them to help a student in self-assessment. The questions will not only pertain to statements but also to drawings. Should we not end by suggesting, say half a dozen questions, for each unit the answers to which may keep the students to assess the quality and accuracy of what he has done? There is nothing sacrosanct in what has been proposed or gleaned in this short paper. The format has to be finalised over a note of broad concensus.

UNIT—I

Map Making and Map Reading

A. Map Making : Scales—Their Use

I. Basic Understanding and Construction

(1) A scale is the ratio of distance between two points on a map and actual distance between the corresponding points on the ground.

(2) A map is drawn on a certain scale. Different maps may have different scales.

(3) Scales are expressed in three different ways :
(i) Statement, (ii) R.F., (iii) Graphic or Linear scale.

(4) A 'large scale map' shows smaller area of the ground, and a 'small scale map' shows larger area of the ground.

(5) R.F. is the ratio between the distance on the map to the corresponding distance on the ground and it is independent of any particular unit of measurement.

(6) The diagonal scale helps to read the small distances precisely.

(7) With the enlargement or reduction of a map, the scale changes.

(8) With the help of a scale the actual distance between two points and also the area of the region shown on the map can be found.

II. Components

1. Scale : Representation of scale
   - (i) Statement of scale
   - (ii) R.F.
   - (iii) Graphic Method
     - (A) Linear scale
     - (B) Diagonal scale
2. Measurement of an area
3. Enlargement and reduction of maps

III. Technical Terms

- (i) Scale
- (ii) Statement of scale
- (iii) Representative Fraction (R.F.)
- (iv) Small scale map and large scale map
- (v) Linear scale
- (vi) Diagonal scale
- (vii) Primary, Secondary and Tertiary divisions.

IV. Pivotal Points

(i) The scale of the map is chosen keeping in mind the details to be shown and the purpose of the map.

(ii) The scale of the map can be changed by enlargement or reduction of a map.

V. Activities

1. To measure distances on a map with the help of a piece of paper or thread.
   - I. Distance between any two places.
   - II. (i) Length of a river
     - (ii) Length of a boundary of a state
     - (iii) Length of a road or railway line

III. Area of a region.

Steps to measure the distances using the Linear Scale

(A) Place the straight edge of a piece of paper along the two points on the map and mark off these points on it.

(B) Place this piece of paper on the Linear scale in such a way that point 'A' coincides with the zero of the scale.

(C) As point 'B' is not coinciding with a division of the scale, shift the piece of paper so that 'B' point coincides with the 3rd division showing 30 kms on the scale. Now read the position of A on the secondary division.

(D) It is 2 cm on the secondary division. Thus the distance between the two points, A and B is 32 kms.

2. To measure curves or irregular lines on the map with the help of a piece of thread.
   (i) Place a piece of thread along the irregular line.
   (ii) Keep one end of the thread fixed at starting point and trace the thread along small stretches of the curve till you reach the next point. Remove the thread and measure the length of the thread on the scale. Convert each of the thread into actual distance according to the scale of the map.

3. Using square method, measure the area of a region.

Construction of a Diagonal Scale

A Diagonal scale is used to measure distances more accurately as compared to the Linear scale, upto the smallest possible division. The procedure to measure small distances with the help of a diagonal scale is given below.

(i) Draw a line AB equal to 1 cm length

(ii) Draw AX and BY perpendiculars to AB

(iii) On AX and BY mark of ten equal divisions of any convenient length.

(iv) Now Join the corresponding points on AX and BY.

(v) Divide Line AB and XY into 10 equal divisions and mark them as 1, 2 and so on as shown in the figure. 1.

(vi) Join 0 of AB with 1 of XY and 1 of AB with 2 of XY and so on.

(vii) It is obvious from the figure that . . .

$XY = 1$ cm

$Y\,1 = \frac{1}{10}$ Cm $= 0.1$ Cm

$a\,a' = \frac{1}{10}$ of $Y - 1 = \frac{1}{10}$ of 0.1 Cm—0.1 Cm. Teacher is expected to explain properties of similar triangles.

$b\,b' = \frac{2}{10}$ of $y - 1 = 0.02$ Cm

$c\,c' = 0.03$ Cm and so on

Thus to read 0.01, read along the line I. To read 0.02, read along the line II and so on.

VI. Precautions

(i) The use of the phrase equal to while expressing the scale is incorrect. Instead of saying 1 cm equal to 2 km we should say 1 cm : 2 km

(ii) All distances should be measured from zero on the linear scale.

(iii) R.F. does not indicate any unit. The numerator in the R.F. is always 1.

(iv) It is convenient to indicate the distances on the scale in round numbers.

VII. Evaluation

(i) Which one of the following is the largest scale—

(a) 1 cm : 200 kms
1 cm : 4 kms
1 mm : 4000 ms.

(ii) Measure the following distances from the atlas map and verify your results.
  (a) Length of River Narmada and Tapti.
  (b) Air distance from Bombay to Paris, Bombay to Delhi.

(iii) The R.F. of the map is 1 : 100,000. It is reduced to 1/2 the size. The R.F. of the reduced map will be
  (a) 1 : 15,000
  (b) 1 : 200,000
  (c) 1 : 250,000
  (d) 1 : 15,000

(iv) On the following diagonal scale, the distance marked on the line A and B is :
  (i) 2.47 metres
  (ii) 2.84 ,,
  (iii) 2.45 ,,
  (iv) 3.10 ,,

diagram to be drawn by the teacher.

Tick the correct answer.

VIII. Application and Integration

Distance and area of the regions or tracts on the map can be calculated with the help of a scale. The scale of the map helps us to measure distance between places and areas of the regions shown on the map.

Points raised

1. Instead of the words 'on the ground' the words 'on the earth's surface' may be used.
2. The term 'Tertiary Division' may not be introduced.
3. Large scale and small scale maps need elaboration.

B. Map Projections

I. Basic Understandings

(1) Map projection is a cartographic device by which the lines of parallels and meridians are transferred or projected from spherical surface of a Globe to flat surface.

(2) As the three dimensional surface of a globe is projected on two dimensional surface of a paper, the graticule projected is bound to be distorted. Thus no projection is correct in all respects.

(3) Different projections have been devised for different purposes and the choice of a map projection depends upon several factors.

(4) It is very difficult to construct a projection even for a small country in which area, shape, direction and distance can be represented correctly.

II. Components

(i) Meaning and importance of projections.
(ii) Developable and Non-Developable surfaces.
(iii) Classification.
(iv) Construction of map projections.
(v) Choice of map projections.

III. Technical Terms

(i) Grid and graticule
(ii) Developable surface and Non-developable surface
(iii) Equidistant projection
(iv) Homolographic projection
(v) Azimuthal projection
(vi) Orthmorphic projection
(vii) Central Meridian
(viii) Standard Parallel
(ix) Conical projection
(x) Cylindrical projection
(xi) Zenithal projection
(xii) Perspective and Non-perspective projection
(xiii) Great Circle

IV. Pivotal Points

(i) The idea of Developable and Non-developable surface.

(ii) Perspective and Non-perspective projection.

V. Activities

(i) To project the graticule on a piece of paper by placing the light at different points through a wire globe.

(ii) Cylinder or Cone made of paper may be placed over a globe and the latitude touching the globe should be marked on the paper and then cut the cylinder or cone to make it a flat surface to show the basis of construction of map projection. (Diagrams of cylinder & cones from 'Map work and Practical Geogrophy' Raghunandan Singh and Lekhraj Singh page No. 40 Fig. 40).

(iii) Comparative charts of major map projections, with the map of a country (Greenland, Russia etc.) shown on this.

(iv) Different projections drawn on tracing papers on the same scale and superimposing them for comparison.

(v) Collection of world maps on different projections.

VI. Evaluation

(i) Write down three properties of the following projections.
- (a) Cylindrical equal-area
- (b) Zenithal equal-area
- (c) Simple conical with one standard parallel.

(ii) Which of the following projections is most suitable to draw a map of the continent of Asia-
- (a) Cylindrical Equal-area
- (b) Zenithal Equal-area
- (c) Conical with one standard Parallel.

(iii) Match the columns

Name

(a) Cylindrical
(b) Zenithal
(c) Conical

(Diagram to be given here by the teacher.)

(iv) Which of the following statements are true :
- (a) The scale along the standard parallel in the simple conical projection with one standard parallel is incorrect Yes/No
- (b) The pole is projected as an arc of a circle in simple conical with one standard parallel. Yes/No
- (c) A simple cylindrical projection is an equal area projection. Yes/No
- (d) Zenithal equal-area projection is an orthomorphic projection. Yes/No.

(v) For drawing maps of small countries like Sri Lanka, Nepal and France which one of the following projections will be the most suitable :
- (a) Cylindrical equal-area
- (b) Zenithal equidistant
- (c) Simple conical with one standard parallel
- (d) Simple cylinderical.

(vi) To show the Trans-Siberian Railway line, simple conical projection with one standard parallel is the most suitable because
- (a) of its great latitudinal extension
- (b) of its great longitudinal extension
- (c) Every point is at its true distance and in the right direction from the pole.

(vii) Association and Integration
- (a) Making judicious selection of the projection depends upon the different themes required to be depicted on the map.

C. Elementary Land Surveying

I. Basic Understanding

1. Surveying is the art of map-making.
2. Geographer uses this art in conducting local surveys for preparing maps of the small areas which do not exist.

II. Major Components

Methods : (a) Chain and Tape
(b) Plane Table

III. Technical Terms

1. Triangulation
2. Check Line
3. Off sets
4. Plotting
5. Horizontal Plane
6. Base line
7. Orientation of the Table
8. Orientation and Re-orientation
9. Bearings

IV. Pivotal Point

A knowledge of the art of surveying helps one in map-making, particularly in the preparation of local maps and plans.

Materials and Equipments

(1) Chain (100 ft or 30 metres) (2) Tape (15 metres) (3) Ranging Rods with flags (4) Arrows (5) Optical Square (6) Trough compass (7) Field Book (8) Plane Table with Tripod (9) Alidade (10) Umbrella (11) Spirit Level (12) Pencils and Eraser (13) Plumb bob with fork (14) Drawing Paper and Pins.

Steps and Procedure

(i) Reconnaissance of the area—Preparation of a rough sketch of the area
(ii) Division of area into triangles
(iii) Alignment of the chain along the Base line fixed between the stations A and B.
(iv) In the textbook, somehow it is being missed. It is advisable to tell in detail how to find out north while surveying the area by chain and tape and marking the north with the help of Trough Compass.
(v) Taking offsets of the permanent features along the chain line.
(vi) Recording measurements in the field-book beginning from point A (given at the bottom) to point B (to the top as shown in diagram 12). Similarly we proceed from B to C and from C to A to complete the triangle.
(vii) Selecting the scale for plotting with the help of field book on drawing paper.

Steps for Plane Table Survey

(i) Selection of the base line in the area and drawing the same on the paper according to the scale.
(ii) Fixing the table on station A with the help of plumb-bob.
(iii) Place the alidade along the base line AB on the paper.
(iv) Orient the table until the points A and B on the paper and points A and B on the ground fall in one line.
(v) Mark the north with trough compass.
(vi) Sight important objects from station A, draw rays and label them clearly.
(vii) Remove the table from station A to B. Centre it at 'B' and reorient the table from station B.
(viii) Draw the rays sighting the same objects from station B, intersecting the rays drawn from A. The points of intersection are the positions of the objects on the map.

Precautions

1. Take care and check up your instruments before using them. Handle survey instruments properly.
2. If any instrument becomes out of order, inform your leader.
3. Obey instructions of the leader of the survey party.

4. Take, as far as possible, measurements and readings accurately.
5. Don't forget to prepare a rough sketch of the area and make its use during the survey-work properly.
6. Note down systematically and legibly the measurements and readings in the field-book.
7. While drawing the plan, do not forget to put its title, scale, North-point Index and name of the survey-party.
8. Always use conventional symbols in drawing your plan finally.
9. Deposit the instruments after making survey. Check, no instrument should be left out in the field after the work is over.
10. Keep your pencils, colours, erasers in order to make their proper use.

VI. Activities and Exercises

1. Make a chain-tape survey along a road between two stations A and B measuring 40 metres and prepare a plan.
2. Take the plan surveyed by you into the field and check some of its main points by measuring them on the map and in the field respectively.
3. Prepare a plan of your school by surveying and exhibit the same on the Notice-Board.
4. Discuss among the members of the survey-party, the problems which come across while surveying by chain-tape/plane-table.
5. Conclude after discussion the major advantages of chain-tape survey over plane-table or vice-versa.
6. Which is the quickest, convenient and more correct method of surveying? Give reasons of your choice?
7. Classify merits and demerits of each of the types of surveying you have studied?

For Teachers Only

8. Make an exhaustive list of survey instruments you would like to purchase to equip geography-room. Mention names of some of the agencies dealing in survey instruments.
9. Prepare a plan of a store-room where you keep the survey instruments. What steps would you take to keep instruments in order for use?

Finding directions

Steps : 1. The four major cardinal points, north, south, east and west can be found in the field by observation, experiment and instruments.

2. As the sun does not generally rise from exact east and does not set in exact west, we find out true north by fixing a Rod in the open ground. Mark the position of its shadow in forenoon and in afternoon. Bisect the angle formed to get north direction.

3. During starry nights, the Pole Star in the northern hemisphere is found. It always points to the north. In southern hemisphere, a constellation of stars known as Southern Cross helps us to find the north.

4. A wrist watch is placed on the palm in the sun and let its hour hand point to the sun. Bisection of the angle formed by the hour-hand and line joining 12' O'Clock with centre of watch gives us the north.

5. The Mariner's Magnetic Compass and Surveyor's trough compass or prismatic compass give us the

position of magnetic north any time and in any season. The magnetic north, however, differs from true geographical north. This declination varies slightly from place to place. Prismatic compass should better be fixed on a tripod for using it in the field.

6. On the map, north is conventionally shown pointing to the top.

Integration with field work and surveying

Finding of the directions is done during excursions, land surveying and field work.

D. Map Interpretation

I. Understanding

1. Only drawing a map of an area is not an end for a geographer-its systematic interpretation is essential to understand man-environment relationship.
2. It (systematic map-interpretation) helps us to know the natural resources and human responses of an area which forms actually the basis of its trend for future development and area-planning.
3. There are various types of maps because they are prepared for specific purposes. Their purpose should form the pivotal-point of interpretation to lead us to meaningful generalisations. (Table 1)

TABLE 1

Classification of Map

- Scales Basis
  - Cadastral
  - Topographic
  - Atlas & Wall Maps
- Functional Basis
  - Relief
  - Climatic
  - Population
  - Administration
  - Others (miscellaneous themes\purposes)

Setting of the map

For interpretating in the field it is essential to orient every map to the North. (Magnetic North and Geographic North to be clarified under Technical Terms)

4. Map has its own language which is expressed by conventional symbols, and colours.

II. Salient Points or Major Components

(a) Map Interpretation
(b) Topographical and Non-Topographical maps
(c) Conventional Symbols
(d) Generalisation/major theme
(It is related with the highlights of an area depicted on the map).

III. Technical Terms

1. Conventional sign and Standard colours
2. Magnetic Variation or declination.
3. Thematic map
4. Bench Mark
5. Settlement patterns
6. Names of contour features (To be picked up from text).

Steps of Map Interpretation or Procedure

(a) Setting of map/orientation
(b) Marginal Information
(c) Relief and Drainge : Including Division of the area into Geographical Units.
(d) Identification of various contour forms. Methods of drawing and labelling of contours.

(e) Climate and Natural Vegetation
(f) Human Settlements (Table 2)
(g) Transport : Means and Modes and linkages

Table 2

Human Settlements

- Urban
  - Site
  - Size
  - Cultural social-economic institutions.
  - Functions and linkages
  - Spacing or distribution
- Rural
  - Type of dispersion
  - Formor pattern (Circular, irregular, linear)
  - Site
  - Human activities

IV. Pivotal Points

To seek inter-relationship among various aspects for understanding human responses in an area is the crux of the entire job of map-interpretation e.g. Relationship between the following may be sought :

1. Influence of relief on drainage.
2. Inference of climate from natural vegetation and of rock type from observing the physical features.
3. Influence of relief on means of communication and settlements, and finally.
4. To find out how people have responded towards the physical features and the natural vegetation of the area.

V. Activities

1. Tracing out the following details from the Topo maps :
   (i) Relief
   (ii) Drainage and water features
   (iii) Land use: Forests, cultivated land, uncultivated land, grass and scrub lands. Settlement and transport patterns.
2. Super-imposing in pairs and bringing out the relationship between the two variables.
3. Comparting the various features with the help of aerial photographs, if available.
4. If a local map is available, the teacher should take the students to the area and identify the objects shown in the map with the objects on the ground.

VI. Evaluation

1. What are V.I. and H.E.
2. Distinguish between V.I. and H.E.
3. Identify the following on the given contour map and label the number of the contours. (A contour unlabelled Diagram is to be Supplied)
4. Tick the correct answer

I. Cadastral Maps are
   a. Municipal maps showing town-limit correctly.
   b Large scale showing every field accurately.
   c. Maps showing roads and plans of villages.
   d. Details of land use-pattern of large area.

II. Topographic maps are prepared by
   a. Municipal committee
   b. Land Record Office
   c. Survey Department
   d. Block Development Office

5. Give three important uses of Relief-maps.

6. Distinguish between climatic and Weather-map.
7. Describe briefly the procedure of setting of the Map.
8. Identify with the help of contour-lines shown in fig. 36, p. 49 of the textbook the following features :
   (i) A plateau
   (ii) A river valley
   (iii) A river tributary
   (iv) Steep slope
9. Distinguish between hill-shading and hachures as methods of showing relief.
10. Write advantages and disadvantages of hachures as a method of showing relief of the region.
11. Show the following relief features by drawing contours :
   (i) a cliff, (ii) a spur, (iii) a conical hill of 2100 metres with a steep-slope, and (iv) a knoll of 300 metres in the plain-region.
12. Study house-types of your own locality and answer the following :
   (i) Building-material used
   (ii) Shapes of the house
   (iii) Building material of the roof and its shape
   (iv) Number of storeys
   (v) Mark various uses of the house such as : Residential, storage-place, cattle-shed, workshop, others, etc.

   Write a few lines about the impact of local environment on the houses of the locality.
13. From the given map draw the cross section along the line AB, already marked.
14. Intepolate or draw the contours on the given spot heights already marked.
15. Identify and label the given conventional map signs.
16. Study the topo sheet 63 k/12 and interpret the same under following heads :
   (a) Divide the area into major geographical unit.
   (b) Trace the influence of relief on patterns of settlement and means of transport.
   (c) Draw major generalisations emphasising on human activities of the people of the area and the responses of the people towards natural environment of the area.
17. What precautions are necessary in drawing the contour lines in a diagram ?

UNIT II

Cartographic Techniques

I. Major Understandings

1. Cartographic techniques are essential for studying spatial distributions and variations in their patterns.
2. Statistical data can be represented either by point, time, area symbols or by one dimensional, two dimensional or three dimensional diagrams.
3. The changes in the values of a particular element over a period of time can be shown by a graph.
4. Absolute values, proportions or percentages can be represented by one or more than one cartographic methods.

II. Main Components

1. Statistical Diagrams dot, pie-diagram, square, proportional symbol, star diagram.
2. * Bar (simple and compound) Histogram, Pyramid.
3. Graphs—simple and multiple line-graph.

III. Pivotal Points

In the case of histograms having unequal class intervals their heights are proportional to the ratio of the frequency to the class intervals.

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* Wherever they represent area, they are called area diagram.

IV. Technical Terms

1. Symmetrical curve
2. Asymmetrical curve
3. Histogram
4. Polygraph
5. Proportional circles
6. Pie Diagrams
7. Wheel Diagram
8. Abscissa—X axis
9. Ordinate—Y axis

Area of Integration (correlation) between theory and Practical

(i) Histograms need to be related with study of population and climate in geography at +2 stage.

(ii) Compound bars and proportionate circles and squares may also be used while studying economic geography.

Hints for procedures and steps

Line graph

Materials

(a) centimetre graph paper

(b) Suitable data to be selected from the theory textbooks.

Procedure

Draw two perpendicular lines (one horizontal and the other vertical). Consider the horizontal line as X-axis and the vertical as Y-axis. Mark the time scale (year, month, hour etc.) along the X-axis and the quantitative scale for the given variable the Y-axis. The scale subdivisions be kept along equally spaced. Mark the data along the two axis and plot the point of intersection. Join the successive points by straight lines, Label, the X-axis and Y-axis properly. Give the title suitably outside the diagram.

V. Precautions

(a) Choose the two scales according to the size of the paper.
(b) Arrange the diagram in the central part of the paper leaving margins on all sides.
(c) Choose the two scales proportionately as far as practicable.
(d) In the case of climatic graphs, names of months should be written between the divisional points along the time scale. The values be plotted in mid-column. The extreme points be extrapolated upto the frame on either side at a point which represents the mean value of the first and the last values plotted. This is to be adopted only in the case of climatic data.
(e) Fine pencil points should be preferred for drawing lines.

Histograms cum Polygon or Polygraph

Given material—class-intervals and frequency under each class—

Steps—

1. Mark class-intervals along X-axis and their frequency along Y-axis.
2. Whenever there is a gap between the class-intervals an equal gap is also left between every two successive blocks. When no gap appears between the class-intervals the blocks are continuous. Histogram is complete.
3. Fix the mid-point of the upper side of each block and join them by straight lines. Extend the line to the two extremes of the base line to complete the frequency polygon. In case of frequency polygraph, the mid-points of the upper side of the blocks are joined by a smooth curve.
4. In case the class intervals are not equal, divide the frequencies by the corresponding class-intervals in order to fix the height of the columns. (Refer Table & Fig 20=the textbook).
5. In case of continuous series frequency polygraphs are drawn but in case of non continuous series frequency polygons are drawn.

Examples

Class Interval		*Frequency*	
0—100	—	5)	
101—200	—	9)	discontinuous series
201—300	—	2)	
0—100	—	5)	
100—200	—	9)	Continuous series
200—300	—	2)	

In the case of polygraph curve should be drawn with free-hand.

Pie-diagram

1. Proportionate circle
2. Wheel or circle

1. Proportionate Circles

Procedure : **1.** Calculate the Sq. root of each figure in the given series.

Select a suitable scale

Example :

cities	*Population*	*Sq. root*
A	8100	90
B	4900	70
C	2500	50

Let a circle with a radius of one centimetre represent a population of 10000.

Scale : 1 Cm. representing 100 sq. root of 10000. The Sq. root 90 will

be represented by $\frac{90}{100}$ or 0.9

70 ,, ,, ,, by $\frac{70}{100}$ or 0.7

50 ,, ,, ,, by $\frac{50}{100}$ or 0.5

Draw respective circles with the help of calculated radii.

We can also arrange the circles in such a way that a common straight line is tangent to all the respective circles.

2. *Wheel diagram*

1. If data pertaining to area, population or economic products are given for the total area and its sub-divisions, wheel diagram is most suitable device for representing the data.
2. Circle represents the total sub-division by each proportionate sectors.
3. Sectors are drawn by angles calculated.
4. Begin with the Vertical radius and proceed further in a clockwise direction.

If data pertaining to two different areas are given proportionate circles first be drawn to represent the total figure of each area.

Divide each circle following the method as already stated above.

Bar diagram

Procedure

1. Take X-axis and Y-axis on a graph paper (cm.)
2. The length of the bar is proportionate to the quantity given. Width of the bar is drawn uniform irrespective of the quantity.
3. Arrange the data in ascending or descending order except in case of time-scale shown on the other axis.
4. Generally a narrow uniform gap is left between two successive bars.
5. Arrange the bars vertically. But bars can also be arranged horizontally so that their bases touch a common vertical line.
6. Compound Bars are sub-divided bars where each sub-division represents part of the total figure.

Bar and Histogram are two different types of diagrams. Histogram shows frequency distribution, while bar simply depicts quantity.

Multiple—Bar Diagram

When two or more sets of data are shown for the same areal unit by means of bars side by side for the sake of comparison it forms a multiple bar diagram. For example :

Male and female, Literate and Illiterate, Rural and Urban population etc.

These are drawn just as on the principle of simple bar diagram but different shadows are given representing different components. A key should be given explaining the various shades used.

Precautions

1. Same shade must be given for showing the same component.

2. Two or three components comprising one unit must be placed close to each other.
3. Uniform gap should separate one composite unit from another.
4. The gap between the two bars should not exceed the width of the bar itself.

Proportional Symbols

Bars, rectangles, squares, triangles, cubes, circles, spheres and other pictorial symbols are used to represent proportionate values of any element. Any of these when used in maps are called symbols.

I Square

Procedure

1. A sq. of suitable size (say 0.5 mm^2) is taken as a symbol to represent, a definite quantity of the element or commodity to be represented.

2. Calculate the number of Sq. for the quantity under each unit-area.

3. If the quantity is not divisible by the quantity representing one symbol, a fractional part of the unit Sq. (say 1/2, 1/3, 1/4) should be drawn to represent the proportionate part. If the remainder or deficit is less than one-fourth it may be neglected.

4. If more than one sq. is required to be drawn, arrange them properly (evenly spaced), but not more than ten in a row. If the number exceeds 10 make another row or column and so on.

Arrange the rows or columns of Sqs. equally spaced.

It is better that along with the title, the technique may also be indicated within bracket.

Graded Symbols

1. Graded symbols as circles may be qualitative as well as quantitative or both. In case of qualitative symbol let the circlces be of some suitable uniform size using different shades for different grades.
2. In case of quantitative grade, the radii of the circles of different sizes will be calculated.
3. Very dark shades or colours should generally be avoided.
4. Location of the place should coincide with the centre of the circle.

Locational Symbols

Use of symbols for placement in the map to represent location of various types of items (Fig. 26A).

In this map the symbols used are not proportional-qualitatively or quantitatively. Only their placement shows distribution.

Precaution

As far as possible overcrowding of symbols in a map should be avoided by judiciously choosing the number of items and nature of symbols.

Star Diagram

Star diagrams are generally used for representing climatic, economic, and population data usually involving movement and direction.

A windrose is a typical star diagram.

Procedure

1. The centre of the diagram coincides with the place to which it pertains, a small circle is drawn around the centre.

2. A suitable scale is choosen for representing number of days the wind blows from particular direction.

3. Straight lines radiating to eight cordinal directions from the centre are drawn.

4. The lengths of the radial lines are proportionate to the number of days measured from the centre, during which the wind has blown in that direction. Each line is measured from the periphery of the circle.

5. The number of the calm-days (wind velosity less than 1 km.) is written within the circle.

6. The windrose is also a form of star-diagram.

Pyramid

A typical Pyramid has broad base and has a tendency of tapering towards the top. Pyramids are commonly used for showing age and sex composition of demographic data.

Material : Data-Table showing age and sex composition of population of a region.

Steps : 1. Draw a horizontal base line according to a suitable scale depending upon the number or proportion of males and females in the lowest age group. Divide the baseline by a vertical line (drawn upward) showing males and females on either side. Usually the vertical line appears in the middle because the number of male and female children are almost equal at the time of birth.

2. The base line be subdivided according to the scale taken with Zero marked at the point of intersection of the vertical line and the horizontal base.

3. The vertical line is to be subdivided for various age groups.

4. The length of the rows representing various age groups will correspond to the number of proportion falling in each age group.

5. The corresponding age group may be written in the middle of each row.

6. Different shades may be used in shading the rows for males and females.

7. A suitable interval of age-group (say 0-9, 10-19, 20-29 and so on) may be chosen to give it a perspective view of a pyramid.

Pivotal Point

1. Interpretation of population pyramid can be used for age-sex composition/working and non-working population.

Dispersion diagram

Materials : Rainfall data of Allahabad for each month for 35 years.

OR

For each year (yearly average) for 35 years.

Hints for procedure

1. Show months along 'X' axis and the rainfall in millimetres along 'Y' axis choosing a proper scale taking highest and the lowest amount of rainfall into account.
2. Continue plotting the monthly rainfall for each month of each year along '*Y*' axis. There will be 35 dots for each month. (In the case of yearly data we shall get 35 dots, one for year).

Precautions

1. If there is no rainfall, dot is put on the base line.
2. If three or four years have same rainfall, overlapping may be shown side by side.

Note :—If the dots are clustered in a narrower band, it indicates less variability and the vice-versa. The diagram shows the maximum rainfall in a particular month/year and how long there has been little or no rainfall i.e. variations spread over a period of time of any element. As the diagram 29 in the text takes a number of things together, a simpler diagram given above is suggested.

Dot maps

Materials

1. Absolute figures for a given period of time for a given area or number of units, say population figures, rice or wheat production, number of sheep or goats etc.
2. Base map with political/administrative boundaries and relief.
3. Dot pen.

Hints for procedure

1. Taking into account the scale of map, decide about the value of the dot. If for example, the base map is of a state, (i.e. that is a relatively large scale map) the value of the dot may be small.
2. In computing the value of dots, half or more than half is to be taken as one dot.
3. Size of the dot should be so chosen as to avoid coalescence of dots in a unit as far as possible. High and low values and the area of the Unit on the map may be kept in view in deciding the size of the dot. The map need not be very empty or give too crowded a picture.
4. Calculate the number of dots for each administrative units based on steps 1 and 2 above.
5. Dots should be placed at random so as to give a natural distributions.
6. Dots should be placed to correspond with actual distribution. Negative areas are to kept out. (By negative areas we mean areas where a particular district is not likely to exist).
7. Key indicating the value of the dot, the scale and the title of the map be given.

Precautions

1. Administrative boundaries if shown should be faintly drawn so as they may not cross with the distribution of dots.
2. Dots should be of uniform size.
3. Administrative boundaries need not appear as break lines.
4. A fraction of a dot will not be plotted.
5. A dot map showing distributions, as of Rajasthan's population in the text-book, shows patterns and not absolute values. It should be kept in mind while using such a map.

Isopleth Maps

Matrieals

1. Base map of India showing stations for which rainfall figures are available.
2. Rainfall data .... average annual rainfall/average rainfall of a time period.

Hints for procedure

1. Put the rainfall figures as near the centre of the areal unit as possible on the map.
2. Choose appropriate intervals for drawing the isopleths, keeping the high and low values in view.
3. Interpolate similar to interpolation of contours. Assuming the variations between points marked on map to be

uniform, locate points on the map at which the chosen class interval values are likely to occur. For example, if class intervals chosen are 30, 40, 50, locate points at which they are likely to occur.

4. Join the points having same value by a smooth line.
5. Label the line at both ends.
6. For purposes of better visualisation, we may shade the space between the lines by adopting a graded scheme of shades.

Precautions

1. Isopleths should not cross each other. (Refer to map given in the text wherein these lines seem to be crossing each other).
2. Value of isopleths should be in round numbers as far as possible.
3. Preferably intervals should be kept uniform.
4. Number of class intervals should neither be too many nor too less—ranging 5 to 10 in all.
5. Isopleths be not left loosely ranging here and there in the map.
6. Key to shading be given.
7. Isopleths should be drawn from lowest to highest values assuring that there is a continuity in distribution.

Choropleth Maps

Precautions and Steps

1. In the case of isopleths, these lines are imaginary lines based on values plotted on the maps. In the case of choropleths, boundary lines are actual administrative boundaries and values are considered spread all over. A base map, showing boundaries of administrative divisions for which the data required to be plotted is available, is procured.
2. Examine the data given or convented usually into ratios or percentages. Seeing the average, the values are arranged in groups in ascending or descending order.
3. The values must not be normally grouped in more than 6-7 ranges, choosing suitable intervals.
4. Retaining the administrative boundaries in the map, the data is simply plotted.
5. A graded shading scheme is properly decided and shades given to corresponding group of values plotted in the map.
6. Unlike the dot map, negative areas are also covered.

Flow Diagrams

In these maps, we are not portraying spatial distributions but are concerned with spatial interaction, say between a regional node and its hinterland (area of influence) around. As the maps convey the idea of movement of people, commodities or vehicles, these are dynamic maps.

Steps and Precautions

1. Prepare a base map with important places and routes radiating from the main nodal point.
2. Data may, for example, be collected from the Railway time table or from the schedules supplied by Bus authorities.
3. The flow lines (along the routes of movement) are thickened in proportion to the quantity or number of

articles/vehicles, people moving along them in that direction in a given time interval.

4. Scale of flow lines be so chosen that it is neither too thick nor too thin.
5. Arrows be marked to indicate the direction of the flow.
6. Map of Delhi showing Railway lines in different directions and daily frequency of trains moving on the tracks be taken for learning the steps involved. (For choosing scale, reference to "Maps And Diagrams" by F. Monkhouse Edn. III pp. 308 be made.)

Activities and Correlation

For understanding nodal region, a correlation with textbook on Geography of India for class XII (NCERT publication) may be made.

Chorochromatic and Choroschematic Maps

Distributions in these maps are shown with the help of point, line or colour symbols for both qualitative and quantitative maps.

Steps and Precautions

1. For colour scheme symbols, for instance, a reference to Survey of India Conventional symbols is advised as given on pages 47 and 48 of the textbook.
2. Prepare a base map showing boundaries of the area to be studied.
3. Identify different types of land use and mark its boundaries for preparing a land use map. If boundaries are not known, they may not be given for a rough schematic map.
4. Choose appropriate and preferably conventional symbols.
5. If it is a point symbol, put it on the corresponding point in the map.
6. If it is a line symbol, (used for shading an area) put it as close to the centre of the corresponding area as possible.
7. If the symbols pertain to whole of the area, draw them to cover the total extent of it.

Note :— The method that in general makes use of different colours or tints to show distributions is also named as Chorochromatic or tinting or layering method. This method is also used in colouring the intervals portrayed in isopleth maps. One or more elements may be shown by conventionally selected letters, pictorial, geometrical symbols of equal size or varying size. This is called symbol or choroschematic method.

Area of Integration between theory and practical work

These maps are found in the textbooks on Economic Geography of the World and India. They can be made use of while doing these exercises.

Exercises

Refer to fig 18. p.28 (textbook)

Ex. 1. From the graph drawn estimate the% of urban to total population of India in 1936.

2. Name the decade during which a trend of urbanisation was maximum.

3. The Rate of urbanisation was minimum during the decade :

A. 1931-41
B. 1951-61
C. 1901-11
D. 1921-31

Write the correct answer within the bracket ( )

4. Estimate the % of growth of urbanisation from 1901-1951. ( )

5. On the basis of the Histogram (fig. 20) determine the number of towns having population between (a) 5000 and 10,000, (b) 20,000 and 50,000.

6. (a) Prepare a histogram and frequency-polygon to represent the following data :

%of Marks scored (Class-interval)	No. of students (frequency)
0—20	5
21—40	10
41—60	30
61—80	15
81—100	10

(b) Tick the correct answer :

Frequency Polygon is

(A) series of lines
(B) circular in shape
(C) multi-sided closed geometrical figure
(D) an open curve.

Tick the correct answer

(c) Frequency Polygraph in Histogram is

A. multisided closed figure.
B. a series of lines joining the mid-points of columns.
C. a smooth curve joining the mid-points of the upper side of the columns.
D. a smooth curve joining ends of the columns.

7. Refer fig. 22. p. 31. (textbook)

(a) From the given wheel-diagrams calculate the percentages of area under (a) Culturable waste, and (b) forests in Madhya Pradesh ; and (c) Net area sown and area not available for cultivation in Uttar Pradesh.

(b) Prepare a wheel-diagram to represent the following data : Foreign Trade in India of export and import items and recent data to be provided by a teacher.

8. Prepare a bar diagram to represent the number of pages included in each of the seven chapters in your book on Field Work and Laboratory Techniques in Geography.

9. From its fig. 24 on page 32, assess the following :

A. State having (i) least and (ii) highest% of literates among rural population.
B. % of literates among urban population in India.
C. Name the states where the % of literacy among rural and urban population is less than the National average.

10. Based on the methods and scale adopted in fig. 25, p 33 draw squares to represent rice production of a country which produces 14,400,000 tonnes.

11. Draw proportionate circles to represent the population of the following four cities :

Populations

1. Ahmedabad ____________
2. Shillong ____________
3. Varanasi ____________
4. Trivandrum ____________

12. Prepare a Star diagram from the following data (windrose)

S.C.E.R.T., West Bengal
Date 14.12.84
Acc. No. 3080

S.C.E.R.T., West Bengal
Library
Calcutta
25/3

Wind blowing from	*Number of days*
North	55
North East	75
East	80
South East	30
South	20
South West	15
West	25
North West	40
Calm days	25
Total	365

13. Prepare an age sex pyramid of India and Japan.

14. Prepare a pyramid of number of boy and girl students attending different classes in a school.

(Questions on temperature graph)

15. What is the period of rapid rise of monthly mean temperature of a place?

16. What is the period of rapid fall of monthly mean temperature of a place?

17. In which month the ranges of temperature are the highest and the lowest at a place?

(Questions on a dot map)

18. Name areas having least concentrations?

19. Attempt to account for variations of distribution as noticed on the dot map?

20. Which district has the lowest population? How much is it approximately?

21. Write a few lines on the patterns of population distribution emerging on figure 30 in the textbook.

22. Draw a traffic flow map indicating volume of rail/road traffic to and from your town.

(Link your town with neighbouring towns.)

UNIT III

Study of Weather and Field Work

STUDY OF WEATHER

1. Major Understanding

(i) Weather and climate of a region affect human activities in more than one way. Therefore, it is essential to study day to day variations in weather as seasonal changes in climate.

(ii) Various elements of weather are observed using a variety of instruments. Knowledge about the construction and use of these instruments is essential for observing the phenomena periodically.

(iii) Data recorded from several stations at the same time are transmitted to a central office where they are plotted to get a picture of the regional weather through maps. Such weather maps help us to understand the weather phenomena and also enable us to forecast weather.

(iv) The short-time atmospheric conditions at a place make the weather of that place, whereas the average of these conditions observed over a long period on a wider region constitute the climate of that place.

(v) There are a number of weather components which can be measured with a fair degree of accuracy now.

(vi) Change in one element of weather affects one or all other elements. However, it is on the basis of the predominance of one or two elements that we call the weather sunny, rainy, sultry, windy, chilly, cloudy, etc.

(vii) Weather forecast helps us in different ways in our daily routine.

(viii) Thermometer records temperature and is based on the principle of expansion and contraction of substances because of changes in temperature.

(ix) Air has weight and exerts pressure which can be measured by a barometer. A simple barometer is designed on the principle that the weight of the air column above the surface of mercury in the cup is balanced by the weight of the column of mercury in the tube. The weight of the downward pressure of the atmosphere is equal to the weight of the mercury Column.

(x) In aneroid barometer increase in pressure pushes the lid inward and its decrease presses it outwards. Resultantly the pointer moves on the dial clockwise and anticlockwise respectively with the help of a lever system.

(xi) In Dry bulb Thermometer the readings are not affected by the moisture present in the air. In wet bulb-Thermometer the readings vary with the rate of evaporation which in turn depends upon the amount of water vapour in the air.

(xii) In an anemometer the cups rotate by the force of wind and this rotary movement results in the rotation of the vertical spindle. The revolutions of the spindle show the wind velocity.

II. Major Components

Temperature, pressure, wind direction, wind speed, humidity, cloudiness, precipitation etc., are the major components of weather.

III. Materials required

Thermometers, Thermograph, Six's Maximum and Minimum Thermometer, Barometer, Barograph, Altimeter, Wind-Vane, Anemometer, Wet and dry bulb Thermometer, Rain gauge and snow gauge etc. are the weather instruments employed to measure different weather elements.

IV. Pivotal Points

The data related to weather is observed continuously and recorded periodically so as to be of use at any point of time.

V. Technical Terms

Meteorology—is a science of meters or instruments that help in the study of weather phenomena.

Climatology—is a science that studies different world climates.

Meteorological observatory—is that complex where different weather elements are observed and recorded.

Knot—A knot is a Unit of measuring speed which is equal to $\frac{38}{33}$ nautical miles. A nautical mile is a unit of measuring distances on the ocean and it is equal to 1.1516 ordinary or statute miles. Thus one knot is equal to about 1.32 statute miles.

VI. Activities

1. To establish an observatory in the school and record weather—data daily.
2. To prepare weather news for school bulletins as well as notice board.
3. To exhibit newspaper clippings and charts pertaining to weather information on the School Notice Board.

Thermometers

The students should be given practice to read the readings shown on the scale and observe the following precautions :

(a) Therometers should never be exposed to sunshine and readings should always be taken under shade.

(b) The bulb of the thermometer should not be touched.

(c) Thermometer should be kept away from the walls since the heat radiated by such structures affects the actual temperature.

(d) It should be kept at the level of the eyes.

(e) To avoid some of the above handicaps Stevenson's Screen may be used.

Six's Maximum—Minimum Thermometer

Proper setting of the instrument is necessary. It is done by moving indices in both the limbs with the help of a magnet to the surface of the mercury.

Precautions are necessary while reading Maximum and Minimum temperatures which are scaled inversely.

The lower end of the needle gives the readings.

Wet and Dry Bulb Thermometer

Distilled water should be used in the vessel and the tip of the muslin be immersed in it.

Temperature recording should be done simultaneously, difference to be noted and taken into account while ascertaining the relative humidity with the help of a given table. It is always mentioned in percentages. (Appendix V in textbook).

Fortin's Barometer

(1) Zero adjustment of Fortin's Barometers is done properly by means of raising or lowering the mercury level with the adjustment screw. The level of mercury should just touch the tip of the indicator.

(2) The zero of the vernier should coincide with the level of mercury. It is done by means of the adjustment screw.

Aneroid Barometer

Students should be made to observe atmospheric pressure with the help of Aneroid barometer at different times of the day and in different seasons so as to know pressure variations. It is useful for finding weather variations like storm, rain, etc. also.

Simple mercury barometer

Experimentation of simple barometer should be demonstrated in the classroom.

Rain Gauge

Design of the rain gauge should be explained with particular reference to the circumferences of the funnel and the cylinder as also the base areas of measuring jars and cylinders. It should be noted that the base area of the measuring jar always bears a definite ratio to the base area of the cylinder.

Setting of rain gauge should be in the open ground on a raised platform, away from buildings and trees so that the splash water does not enter the rain-gauge.

Co-ordination

All the terms used in this chapter are studied also while dealing with the chapter on atmosphere. Therefore the teachers should co-ordinate the theory lessons with this practical work. Students should be made to draw weather-symbol chart and comprehend it.

Evaluation

1. Differentiate between Heat and Temperature ?
2. What substances are used in the Thermometer ?
3. Why Aneroid Barometer is known as such ?
4. Find out the pressure at B (1110 metres above sea level) when the pressure at A (330 metres ASL) is 75 cm.
5. Why the bulb of wet bulb Thermometer is wrapped with wet piece of muslin ?

Objective and short-answer questions

(a) The degree of hotness or coolness of air is called ....

(b) The thermometer .... placed in the sun.

(c) 64 °F = ... °C

(d) The boiling and freezing points in Fahren-heit scale are ... . & ...... respectively.

(e) Mercury and alcohol are used in thermometer bulbs because ....

(f) During rainy season the difference between the dry and wet bulb thermometers is.... ....

(g) What precautions should be observed while measuring temperature at a place ?

(h) Why should the rain gauge be placed away from the walls and trees ?

(i) Name different part of a rain gauge.

(j) An anemometer records ....

(k) A knot is unit to measure ....

(l) What do you mean by a Centimetre of rainfall at a place ?

(m) Define precipitation.

FIELD WORK

I. Basic understanding

(a) To understand the distribution of various phenomena and the causal relationship between them in an area, the field work is most essential.

(b) Field work involves observation, recording data after interviewing and enquiry, rough sketching, mapping etc.

(c) Field work involves 3 distinct stages :

  (a) Preparation

  (b) Execution and

  (c) Synthesis of the observations made.

(d) Area selected should be very well known and clearly defined. It may preferably find an association with the syllabus items. Adequate preparation, organisation and planning is essential to achieve good results.

(e) Field work may be intensive or extensive. It depends upon the range of coverage, nature of project and the time available.

II. Major Components

(a) Area or topic of studies

(b) Base map

(c) Sampling

(d) Execution i.e. observation, interviewing, recording, rough mapping.

(e) Synthesis

III. Materials Required

(a) Several copies of Base map of the Area.

(b) Cyclostyled copies of questionnaires and schedules.

(c) Sketch-Book-coloured pencils-erasers.

(d) Topo-sheet.

(e) Any other material depending upon the nature of topic/area.

(f) Measuring Tape and Compass.

(g) Standard keys of symbols used in land use and urban survey,

(h) Augers for soil samples.

IV. Pivotal Point

Selection of 100 fields out of 1000 in a village for investigation is called a sample survey of the land use of a village with 10 per cent sampling.

V. Technical Terms

a. Base Map

b. Primary and Secondary Data

c. Sampling

d. Questionnaire and Schedule

e. Catchment Area

VI. Activities

Conducting field work pertaining to the following :

(a) Traffic flow from and to a town/village.

(b) An urban study of a town, especially its catchment area.

(c) Sociological and economic study of a town/village.

(d) Urban land use of a town or the colony/ward of a city.

VII. Steps

(a) Pilot/Reconnaissance survey of the area.

(b) Grouping the field workers and assigning their specified duties.

(c) Data collection, note-taking and mapping.

(d) Frequency and time of visits.

(e) Data Processing and plotting

(f) Group Discussion

(g) Random checking

(h) Synthesis and preparation of Report

(i) Submitting the Report

VIII. Precautions taken during field work

a. There must be no confusion left about the specific objectives of field work.

b. Hand-books and copies of base maps should be given only when required.

c. As far as possible open-air lectures should be avoided, pin-pointed instructions be given and suggestions invited.

d. An orderly method of note-taking should be adopted by the field workers.

e. Specimens collected during the field work should be properly labelled.

f. Photos snapped during field-work should be marked by respective numbers *while making notes at their* proper places.

IX. Area of integration between Theory and the Field Work

A sort of synthesis involves presentation of the materials collected jointly in a systematic way supported by maps diagrams, specimens and photographs.

Just after finishing the field work of the day pupils may be abvised to write-up their observations the same evening in the diary form.

(Transact Diagram be appended)

Source : Geographical Field-work fig 13 p. 43. fig 14 p. 44.

The entire material and observation made should be exhibited on the bulletin board, emphasising on putting up the maps, diagrams and photographs, specimens from factories etc. be attached and properly arranged according to the written material. The write up should be used while teaching relevant contents of theory syllabus.

X. Evaluation

(i) Conduct a suruey of urban-land use of your own locality.

(ii) Interpret the pattern of urban-land use studied.

(iii) Make a transact diagram on the basis of urban land use of the area studied.

(iv) Prepare a map of the locality showing major uses of land by standard colour-scheme.

(v) Identify various zones on the map such as Residential, Commercial, Administrative, Public Utility Service areas, etc.

(vi) Carry out socio-economic survey of house-holds in part of rural/urban locality under the following heads :

(a) Number of persons—Age and sex structure.

(b) Literacy.

(c) Means of livelihood/occupational structure.

(d) Average income of the family.

(e) Areas of buying and selling goods.

(f) Means and modes of transport.

(g) Products or commodities.

(h) Amenities and Services :

  (a) Light, water, sanitary.

  (b) Education, Health, Administration.

(vii) Conduct a traffic flow survery of your locality and bring out relationships among the nature of land, means and modes of transport and economic life of the people.

A list of field study projects suiting different type of areas :

(i) Agricultural land use of a village.

(ii) Urban land use of a locality.

(iii) Household survey of a rural or urban locality.

(iv) Survey of shops in the vicinity

(v) Occupational patterns of the people.

(vi) Study of the catchment area of a school.

(vii) Traffic flow in a locality.

(viii) A demographic/economic/social study of a few families in the locality (Aspects—size, proportion in population, incomes, age and sex composition, dependency ratio, activities etc.

(ix) Means of transport used.

(x) Agricultural implements used.

(xi) Means of recreation/amenities available in two different areas and their comparison.

(xii) Study of city bus service (No. of routes of buses, frequency, movement of people on each route and some reasons—suggestion).

(xiii) Rural urban settlement/House types (materials used, setting, pattern and functions).

(xiv) Studying population growth and migrations in a locality.

(xv) Demographic structure of a school catchment area (Age-wise, size-wise, worker/non-worker wise)

(xvi) Studying seasonal or periodic migrants in the locality.

UNIT IV

Quantitative Methods

Major Understanding

1. A large and varied amount of statistical data, now available, has brought about a quantitative revolution in the subject of Geography, necessitating the preparation of quantitative maps.
2. Any phenomenon that varies over time and space is called a variable. The variables are of two types : Continuous (like rainfall, slope of land, etc.) and discontinuous (like population, agricultural yield, etc.). The variables have both qualitative and quantitative values.
3. We need a number of appropriate techniques to process, analyse and interpret the data.
4. To bring out the spatial patterns emerging on the maps and a degree of associations between the variables.
5. The data available from primary and secondary sources is to be meaningfully tabulated to suit the purpose of mapping. The spatial patterns emerging on the maps thus prepared are more effective than the mere tables of figures.
6. Maps and tables are, therefore, complementary.
7. Measures of central tendency do not give any information about the spread of value and other characteristics of the data. Therefore, measures of central tendency are to be supplemented by measures of dispersion (and concentration) or the internal variability of data.
8. When a number of variables are studied we may find similarities in the numerical and spatial distribution. Such similarities may be examined by graphical and statistical tables.

II. Major Components

1. Sources of data — Types of statistical tables and their construction.
2. Measures of numerical distributions.
3. Measures of associations (or correlations) between variables.

III. Pivotal Points

1. Very often it becomes necessary to obtain a single representative value for entire data, enabling one to get an over all idea about a particular distribution.
2. An ungrouped or discontinuous frequency distribution is that where, instead of classes, the fixed values of variables are given.
3. While the assumed mean may be any arbitrary value, we usually choose one

of the mid-values in the middle of the series, preferably one with the highest frequency.

4. In the real life problems the lowest values are generally not below 0 (zero). Therefore, arithmetical mean has a built-in upward bias.
5. The range is a crude measure of variability, as it takes into account only the extreme values, ignoring all the other values.
6. The (arithmetic) mean and standard difference of a given distribution may be used to test whether the distribution is normal or not.
7. In a normal distribution, a large proportion of observations are concentrated around the mean.

   $X \pm$ S. D. covers 68.27%, $\bar{X} \pm 2$ S.D covers 95.45%, $\bar{X} \pm 3$ S.D covers 99.73% of the observations and the two tails of the normal curve, while approaching the X-axis never meet it.
8. If L.Q. > 1, it shows concentration. If L.Q. $= 1$, it shows neither concentration nor dispersion. If L.Q. < 1, it shows dispersion over that area.
9. S. D. may be used as a measure for dividing a distribution into different classes for mapping purposes.
10. Relative dispersion (R.D.) enables us to compare two or more distributions. R.D. is expressed in different units.
11. S.D. gives a more precise measurs of dispersion than absolute variability.
12. Lorenz curve is used to measure the deviation of the actual distribution for the line of equal distribution.
13. While the geographical method like scatter diagram gives a general idea about the direction and degree of correlation between two variables. Correlation coefficient is a qualitative measure of the degree of the relation.
14. When the values of rank correlation (RK) coefficient is equal to 1, it shows perfect correlation between the variables.
    - (i) positive value indicates positive correlation
    - (ii) negative value indicates negative correlation
    - (iii) 0 (zero) value indicates that there is no relationship.
15. If the value of Rk is between 0 and 0. 5, the degree of correlation is not very significant.

    If the value of Rk is between 0.5 and 1, the degree of correlation is more significant.

Area of integration (correlatians) between Theory and Practical in Geography

1. Statistical tables given in Textbooks help us to understand the text more meaningfully. Such tables may also be utilized to show spatial patterns on maps.
2. L.Q. is of paramount importance in the study of Economic geography, for assessing the relative concentration or dispersion of various economic activities.
3. Kendall's ranking method is useful for pereparing a composite index of several variables pertaining to an area : for example—The agricultural productivity in India and the regionalisation attempted in class XII textbook on India, is based on this method.

IV. Technical Terms

Variance, Absolute Variability, Ties in Composite ranks	Primary source & secondary source data; Reference tables; Summary tables; Stub, Head, Boxhead; Head note, Foot note; Tally mark, Frequency Table, Cumulative frequency table, Normal frequency curve, skew curve; Mean, Median, Mode, Partition values-Quartile, Decile, Percentile; Unimodal, bimodal values. Range, Quartile deviation, Mean deviation, Standard deviation, Lorenz Curve, Location quotient.

1. Preparation of Tables

Each table should have the following information :

1. Table number
2. Title of the table
3. Heading column or Caption (Box head)
4. Stub
5. Body of the table (i.e. numerical values)
6. Head note
7. Foot note
8. Source

Precautions while compiling a table from data :

1. Tables should not be very large. If a large amount of data is to be shown, it is better to split it into a number of tables.
2. In the case of the names of districts, talukas etc. they should be written preferably in alphabetical order.
3. Information pertaining to time factor should be in chronological order.
4. The units in which the information is given should be clearly indicated at the Head of the Table.
5. All fractional figure numbers should be preferably rounded off uniformly.

Materials for preparing tables :

1. Raw data.

Procedure

1. Study the range of variations of the raw data i.e. highest and lowest values.
2. Choose the appropriate class intervals.
3. Arrange the data in ascending or descending order.
4. Count the number of units in each class-inrerval.
5. Tabulate the frequency value vertically (i.e. columns) on the left hand side and number of units on the right hand side.

Precautions

1. The class intervals should be uniform.
2. The limits of the class-intervals should be whole numbers.
3. The number of class intervals may be preferably between 4 to 10.
4. The class-intervals should continue from the lowest to the highest values, even if there are no values for some intermediate values.
5. The same limit-value of a class-interval should not be in two successive class-intervals. If the class-intervals, for example, are like 26-30, 31-35, 36-40 etc. the values such as 30.1 to 30.4 will go under the group 26-30, whereas 30.5 to 30.9 will go under 31-35.

The frequency table can also be represented as a frequency curve with the class-interval on X-axis and the number of units on Y-axis.

2. Preparation of Cumulative Frequency Tables

Material : The cumulative frequency table is prepared based on the frequency table.

(Cumulative frequency tables are of two types : (1) Less than type, and (2) More than type).

Procedure

1. The first two columns are the same as in frequency table. In the third column the cumulative frequency less than a given value is indicated. For this purpose the frequency value of each class-interval or each class is added to the value in the next class-interval to arrive at the frequency value. These values are entered in column 3.
2. The frequency values of 'more than type' are in column 4. These values are obtained by adding the values from bottom to top (i.e. higher to lower values).

3. Measures of central tendency

The commonly used measures of the Central tendency are :

(i) Mean (i. e. Arithmatic mean)

(ii) Median and

(iii) Mode.

The partition values

The partition values such as quartiles, percentile can be calculated from raw data as well as from grouped data. In the textbook such values given on page 101 are calculated based on grouped data.

The procedure for calculating these partition values from raw data is given in the textbook on pages 103 and 104 in the case of literacy percentage in Madhya Pradesh.

Making use of quartile values we can divide the data into four graded groups (example : on page 104, literaey figures). This categorisation is a help to us. It is necessary, as well, to bring out the levels of literacy in the map of Madhya Pradesh. The map can also be refered to for comparing the disparities in literacy levels in different districts of that State.

Population data on page 95 can also be used for quartiles and deciles by following the same procedure.

Mode Precautions

1. Change of class intervals may change also the values of mode.
2. Though the value of mode can be calculated from the ungrouped data also, the grouping of the values into a frequency table helps in identifying the modal value.

(For advantages and disadvantages of the measures central tendencies, place refer Table 3.)

4. Measures of dispersion

The most commonly used measures of dispersion are :

(i) Range

(ii) Quartile Deviation

(iii) Mean Deviation

(iv) Standard Deviation

(v) Relative Dispersion

(vi) Lorenz Curve-

(vii) Location Quotient

Examples for calculating of quartile deviation : (3)

Precautions

(1) While comparing two distributions, it is necessary to take both values of mean and range because mean value gives the central tendency only and the range is based on the extreme values.

Table 3

Advantages and disadvantages of the measurement of central tendency

Mean	*Median*	*Mode*
Advantages	Advantages	Advantages
1. The actual values are used for computing.	1. It is the mid value of the dispersion.	1. It shows the concentration of values at a glance.
2. Easier or simpler method for computing.	2. The median divides the distribution into two equal parts.	2. It can be located easily at a glance.
3. Most commonly used and understood.	3. It is not affected by the extreme values.	3. It is not affected by the extreme values.
4. Mean values of samples do not differ much from the whole population value.	4. In the case of discrete distributions, like Area under forest, per capita income, levels of economic developments, the median-value is more useful.	4. It is applicable to quantitative data also.
5. Mean value is more useful in the case of continuous values, such as rainfall, slopes etc.		5. It can be used for open class also.
6. It can be subjected to further mathematical analysis.		
Disadvantages	Disadvantages	Disadvantages
1. It is affected by the extreme values.	1. Actual values are not taken into account.	1. It can be calculated only when the data is an array.
2. In case of open ended class intervals, it is not possible to compute the mean value.	2. The median can be calculated: when the data is put into array, which becomes tedious and time consuming; when the data is large.	2. It is not significant unless the data is large.
3. It can be calculated only if the numerical values of all the items are known.	3. It can not be subjected to rigorous mathematical analysis.	3. In some cases there may be more than one mode.
4. In real life problems the mean value has a built-in upward bias because there no value is less than zero.		4. Mode value cannot be put to further mathematical analysis.
		5. For calculating the mode from grouped frequency table, all the values are not used.

(2) Wherever the data are not fairly regular and continuous, the range as a measure of variability should not be used.

Mean deviation

Precaution

(1) For calculating the mean deviation the signs of the deviations (+or—)are ignored. Only the magnitute of deviation is considered.

Standard deviation

Material

Rainfall data for Bikaner and Jodhpur as given on page 110 (textbook)

Procedure

(1) Calculate the mean (arith mean)

(2) Calculate the deviation of each value from the mean (i.e. $x-\bar{x}$)

(3) Square the deviation values thus obtained $(X-\bar{X})^2$

(4) Add all the values of the square deviations i.e. $\Sigma(X-\bar{X})^2$

(5) Divide it by the number of units

i.e. $\frac{\Sigma(X-\bar{X})^2}{n}$

(6) Calculate the sq. root of the value thus obtained in step 5.

i.e. $\sqrt{\frac{\Sigma(X-\bar{x})^2}{n}}$ = S.D.

Calculate the Quartile Deviation using the following data.

Monthly income of 13 Households

Rs. 140, 150, 130, 135, 170, 190, 500, 210, 205, 195, 190, 200, and 250

Step I. *Ascending Order*

130, 135, 140, 150, 170, 190, 195, 200, 205, 210, 250, 290, 500 (Q.2)

Step II. Median (Q.2) is Rs. 195 i.e. the 7th value in the above series of 13 units

Step III. Lower Quartile or Q1 =

$$\frac{140+150}{2} = \text{Rs.}145$$

Step IV. Upper Quartile or Q3 =

$$\frac{210+250}{2} = \text{Rs. } 230$$

$$\text{Quartile Deviation} = \frac{Q3-Q1}{2}$$

$$= \frac{230-145}{2} = \text{Rs. } 42.5$$

Relative dispersion

Procedure : *Lorenz Curve*

1. In lorenz curve the X-axis and the Y-axis show the percentages of two different variables. Thus it is necessary that the raw data is converted into percentage figure.
2. The percentage values are cumulated and these cumulative values are plotted.
3. The area between the line of actual distribution and the line of equal distribution in shaded to give a measure of deviation between them.
4. Narrower the shaded band, closer is the actual distribution to the equal distribution.

5. Scatter diagram

Precautions: *(A) Steps for interpretation*

1. Instead of interpreting the relationships between the two variables on scattered diagram as upward or downward slopes, it is better to interpret as follows:

(a) When an increase in the value of X-variables corresponds to an increase in Y-variable the relationship is said to be positive.

(b) An inverse relationship between X-variables and Y-variables, is said to be negative relationship.

(c) Greater a correlation between the two variables the points tend to group to form a line.

(d) If the points are scattered without any tendency to group along a line, there is an absence of correlation (i.e. no relationship) between the two variables.

(*Note* : Correlation and co-variation should not be used interchangeably).

(e) The scatter diagram shows us two things : (i) degree and (ii) direction of the relation between the two variables. The degree refers to the closeness of points showing alignment. The direction of correlation is either positive or negative.

Precaution

While using fig. 62 on page 121 of the textbook, the top and right hand lines are redundent, Only X and Y axes lines are enough.

(1) The word unity in Statistics (as in this case also) means one 1

(2) If the Rk value, for more than one state, is the same, then, we should follow the interpretation as given in the Kendall's method.

Hints for calculating the values in the scatter diagram table on page 121 of the text.

Material

Raw data is given on page 120 of the textbook.

Procedure

(1) Arrange the values of percentage of literates to total population in descending order.

(2) Mark the ranks of each one of the states from 1 to 18 (no question of ties) $(n=18)$

(3) Similarly arrange the values of percentage of rural population also in the descending order—Indicate the ranks from 1 to 18.

(4) These values are marked in columns 2 and 3 in the table on page 121.

(5) Calculate the differences in ranks as indicated in col. 2 and 3 for each State

6. Ignoring the signs (i.e. + and −) of the differences, write them in col. 4.

7. Square the values of the difference (d) as noted in col. 4. These values are entered in col. 5.

8. Use the formula $Rk = 1 - \frac{6\Sigma\ d^2}{n^3 - n}$

6. Composite Measurement of various variables

Procedure

(with reference to the data on page 115) Kendall's method is explained below :

1. The data relating to yield in metric tonnes per Hectare of five crops in Rajasthan is converted into ranks for each one of the crops. For example—Jaipur dist., which has the highest yield of Maize is given Rank 1. In cases where the values of yield are the same, they are given rank-values equal to the average of the successive ranks e.g. the yield of gram is the same in the districts of Pali and Jalore. These are given the rank values of 13. 5, being the average of 13th and 14th

ranks. The next district is given the rank of 15. This procedure is followed wherever there are ties in the values of ranks. The lowest rank, e.g. in case of Bajra-Banswara and Chittorgarh districts are marked as nil. They are given the same rank as 25.5, being the average of 25 and 26.

2. The rank values for each one of the five crops, for each districts, is added to give the total rank-value.
3. These total rank values are again ranked from the lowest value getting the 1st rank in terms of agricultural productivity. Thus a series of composite value is obtained.
4. These composite rank values are divided into class-intervals for preparing a choropleth map of agricultural productivity of Rajasthan.

Precautions

1. The ranking method is not perfect, because the absolute differences are altogether ignored. The difference between the two successive ranks may be too small or too large.
2. All the variables are treated with equal importance irrespective of their significance in relation to production, area, yield etc.

Location Quotient

The values of L.Q. may be utilized to prepare the spatial distribution map, e. g. see fig. 59 on page 114. It shows L.Q. concentration of tribal population.

7. Index Numbers

Index Number is used to measure the changes in a variable over a period of time with reference to a given base year. If several variables are considered with the same, compare the change in the variable over a period of time.

Procedure

Ref. example on page 118 index number of population (non-agricultural) employment are calculated. Let us see below :

1. For calculating index no. of population with ref. to the base year 1930, the population of 1930 is taken as 100.
2. The index no. of 1940 population equals $\frac{\text{Popl. of 1940}}{\text{Popl. of 1930}} \times 100$ i. e.

   $\frac{132\ 122}{120\ 77} \times 100 = 107$
3. Like-wise the Index numbers are calculated for the years : 1950, 1960 1964.
4. The index no. of 1920 is less than 100, because the population of 1930 is higher than that of 1920.
5. The index number of non-agricultural employment is also calculated in a similar manner with the base year as 1930.

Interpretation of the Data

As the same base year is used for calculating the index no. of population and non-agricultural employment the changes of the two variables can be compared over the time period. The index no. of non-agricultural employment is higher than that of population indicating thereby the rapid growth of non-agricultural employment with reference to population.

Measurement of Relations

1. The mere existance of relationship between the two variables does not necessarily mean one in caused by the other.

2. The measurement of the nature and degree of relation between the variables is called correlation and that between the attributes (i. e. qualitative characteristics) is called association.

3. In the case of correlation between the two variables having a causal relationship the independent variable is one, which causes the change and the other variable is called dependent variable.

4. The correlation between the two variables is said to be positive (+), when the increasing value of one variable leads to the corresponding increase in the other value. It is said to be negative (—), when the increase in one variable leads to the corresponding decrease in the other variable.

Short Answer-Questions

1. Name four different sources of obtaining statistical data in India.
2. Distinguish between a 'reference table' and 'summary table'.
3. What is a Variable ? Name different types of Variables.
4. What are a stub and Box head in a statistical table ?
5. Why is a 'source note' necessary with a statistical table ?
6. What do you mean by cumulative frequency ?
7. The sum of all the individual values in a distribution directed by their numbers is called ————————.
8. Write three characteristics of the most frequently used measure of central tendency.
9. Do extreme values affect the average value ?
10. A series of values is divided in two-equal parts by the mean/mode/median.
11. What are partition values ?
12. How is a quartile different from decile and percentile ?
13. Median is also known as ———————— Quartile.
14. What is the purpose of 'rounding off' the data ?
15. The value around which maximum concentration of items occur is called————————?
16. Differentiate between 'unimodal' and 'bimodal' variables.
17. How do you calculate the range from a set of values ?
18. Why is it necessary to supplement the measures of central tendency by measures of 'internal variability' ?
19. Name three measures of dispersion to overcome limitations of range as measure of dispersion ?
20. Distinguish between Mean Deviation and Quartile Deviation.
21. Standard Deviation is a method of measuring dispersion which is based on ——— values in a distribution.
22. What is the need of 'Relative Dispersion' ?
23. Lorenz curve is used for ————————.
24. Name the method which is applicable to measure the concentration and dispersion of Cotton Textile Industry of Maharashtra.
25. What is the use of Kendall's ranking method ?
26. How do you solve a problem of tie in determining rank values ?

27. ————————refers to a————————in a time series expressed as a relative number.

28. Does a relationship between two variables always mean that one is caused by the other?

29. The measurement of the degree and nature of relationship between two variables is given by ————————.

30. Distinguish between positive and negative correlation.

31. How is the degree of relationship between two variables found out on a scatter diagram ?

32. Differentiate between scatter diagram and correlation coefficient.

33. Which method would you employ to study the price-rise in India during 1952-1980 ?

34. How is the identification of causal relationship helpful in geographic investigation ?

35. Distinguish between correlation and association.

36. Narrate one advantage and one disadvantage of the ranking method.

37. What are the properties of a normal curve ?

38. What are tally marks ?

39. What is the maximum value of rk ?

40. Is it correct to say that if value of LQ is less than 1.00, it shows its concentration over the area ?

41. What is skewness of a frequency curve ?

42. A frequency curve emerges when the points of a frequency polygon are joined by a straight line.

43. Is it correct to say that a straight line diagonal curve at an angle of 45° running from zero across a graph points out a perfect correspondance between the distributions ?

Exercises

1. State four major needs for the use of quantitative methods in Geography.
2. Mention two basic types of statistical tables.
3. Distinguish between the following :
   - (i) Primary and secondary sources of data.
   - (ii) Mean and median.
   - (iii) Head note and foot note of data.
   - (iv) Standard Deviation and Quartile Deviation.
   - (v) Upper and lower quartile.
   - (vi) Standard deviation and Mean deviation.
   - (vii) Continuous and Discontinuous Variables.
   - (viii) Correlation and association.
4. Prepare a frequency distribution table choosing appropriate class intervals.
5. Prepare a commulative frequency table.
6. Find out mean, mode and median values from a given data.
7. Using the grouped data regarding the density of population of villages in a district, calculate the mean deviation and the standard deviation.
8. Use the data related with food production and population of India from 1931 to 1981. Calculate the index number taking 1931 as base year.
9. Use relevant data to prepare
   - (a) a scatter diagram
   - (b) to calculate the Rk coefficient.

   (Data to be selected about urban population and urban literacy in different states of India.)

Note : Teacher to supply required data for questions 4 to 9 above.

Major points and statements
on
Quantitative Methods in Geography

(i) Sources, classification and tabulation of statistical data. What and How of it ?

(ii) Terms, variables and contents ; continuous and discontinuous variables, qualitative variables or attributes ———— Examples.

(iii) 'Methods of statistical analysis are based on mathematical study of probabilities where we have a set of precise numerical observations'.

'Where the operation of random or behavioural factors makes relationships less precise, aggregarion of a large number of observation cases is necessary'.

'The job of statistics is to uncover the regularities and tendencies underlying any phenomenon from a body related data.'

(iv) Characteristics of a good questionnaire for collecting primary data.

(v) Terms 'A Universe of study' and 'a sample universe'.

(vi) What we call 'by and large value' is in other words 'a central value.'

(vii) There are three basic measures of Central tendencies viz. mean, medium, mode— (advantages and disadvantages of each)

(viii) 'The measures which enable us to assess the levels of variability in any set of values are known as measures of variability such as Range, quartile deviation, mean deviation, standard deviation and co-efficient of variation'.

(ix) Lorenz Curve — steps in its preparation.

(x) 'If increase or decrease of one variable does not cause any change in the other variable, the co-caeiation is said to be independent. The tendency can also be of positive or negative relation'.

(xi) 'Where scatter diagram fails to give a quantitative measure of the direction and degree of relationships between two variables, spearman's Rank correlation is adopted as a technique of finding out coefficient of correlation', — Correlative is different from association.

(xii) Index Number refers to a term in a time series expressed as a relative number. A Composite index is drawn by ranking method for example, agricultural efficiency or urbanisation (depending on multivariables data).

(xiii) Location quotient

'If L. quotient is greater than 1, it shows concentration, if equal to unity, neither concentration nor dispersion; if less than 1, it shows dispersion of that characteristic over that area.

(xiv) Preparation of illustrative exercises—both descriptive and numerical on quantitative methods in Geography.

List of Important Formulas

Formula	Meaning of Symbols	When to be used
(1) Arithmetic Mean (Ungrouped data) $\overline{X} = \frac{X_1+X_2+X_3...+X_n}{n}$ or $= \frac{\Sigma X}{n}$ (Short formula)	$\overline{X}$=arith. mean X_1 X_2 etc. stand for variables ... n denotes the number of variables	for ungrouped data
	Σ mean: summations of variables.	for ungrouped data
(2) (a) Arithmetic mean of a frequency distribution : grouped $\overline{X} = \frac{f_1 X_1+f_2 X_2 \cdot +f_nX_n}{f_1+f_2+ .. +f_n}$ $= \frac{\Sigma fX}{n}$ (short formula)	$X_1, X_2... X_n$ are the middle values of the 1st, 2nd ... and n th class, f_1 f_2 —f_n are the frequences of 1st, 2nd — and nth class.	for grouped data, e.g. given in the form of frequency distribution.
(b) (Short cut method) $\overline{X} = a + \frac{fu}{f} \times h$	where a stands for the assumed mean; u " " " deviation of each mid-value from the assumed mean and $u = \frac{X-a}{h}$ h is class interval	-do-
(3) Medium or Quartile Median $= L_1 + \left(\frac{N/2-C}{f}\right)h$	Where L_1 is the lower limit of the median class C is the cumulative frequency of the class preceding the median class, f is the frequency of the median class and h is the magnitude of the median class interval.	for grouped data ; data given in the form of frequency.
(4) Quartile 1, $Q_1 = L_1 + \frac{(N/4-c)\ h}{f}$	Notation of alphabets as in formula 3.	-do-
(5) Quartile 3 $Q_3 = L_1 + \left(\frac{3N/4-C}{f}\right)h$	" " "	-do-
(6) Mode. $M_o = L_1 + \frac{D_1}{D_1+D_2} \times h$	Where L_1 = lower limit of the modal class i.e. the class with the max. frequency D_1 = the difference between the frequency of the modal class and that of the *preceding lower* class. D_2 = The difference between the frequency of the modal class and that of *the following* class. h = The magnitude of the modal class	-do-

(7) Quartile deviation $Q = \frac{Q_3 - Q_1}{2}$	Q_1 = 1st. Quartile Q_3 = 3rd quartile	-do-
(8) Mean deviation $MD = \frac{\Sigma 1 \ (X-\bar{X}) 1}{N}$	11 = modulus implies that we are considering only the magnitude of the variable within it i.e. ignoring the sign. X-X = deviation of the values from the mean or median. N = Total number of observation.	for ungrouped data.
(9) $MD = \Sigma f \ \frac{1(X-\bar{X})1}{N}$	Σf = sum of frequencies. (X-X) = The deviation of the class midpoint from the mean or median.	use for grouped data.
(10) (Standard deviation) $SD \ (\sigma) = \sqrt{\frac{\Sigma(X-X)_3}{N}}$	X-X = deviation of the values from the mean or median.	Data to be grouped. The formula becomes tedious when X involves decimals and if the number of observations is too much.
(11) Short cut method formula $SD \ (6) = \sqrt{\frac{\Sigma X^2}{N} - \frac{(EX)^2}{N}}$	ΣX = summation of variables. N = number of observation.	used when the data is ungrouped.
(12) Coefficent of variation $C \ V = \frac{\sigma}{X} \ x \ 100$	6 = standard deviation X = mean value.	for ungrouped data
(13) Location quotient $L.Q = \frac{\frac{W_s}{W_1}}{\frac{N_s}{N_1}}$	Where W_s = Number of workers in an industry in a unit W_1 = number of workers in all industries in the same unit N_s = Number of workers in the same industry in the Nation N_1 = Number of workers in all industries in the Nation.	To measure the pattern distribution in different parts of the country.
(14) Index number $= \frac{\text{total of the year involved}}{\text{total of the last year}}$ X 100		To measure the relationship between two features during certain period of time
(15) Rank Correlation of Coefficient $R_k = 1 - \frac{6 \ Ed^2}{n^3 - n}$	Where n is the number of observations d is the difference of the ranks of the two variables.	When rank coeft. values are given and the number of observations are given and when quantitative measure of the degree of relationship is to be found.

Agencies and Sources of Statistical Information and other Materials

Addresses

(i) Central Statistical Organisation, Govt. of India, New Delhi.

(ii) Directorates of Economics and Statistics, District Statistical Offices.

(iii) State Directorates of Census Enumeration/Registrar General of India, New Delhi.

(iv) Annual Statistical Abstracts of States.

(v) India, A Reference Aunual
Publication Division,
Govt. of India, New Delhi.

(vi) United Nations Statistical Year books.

(vii) Director, Map Publications, Survey of India, Hathi Barkala, Dehra Dun.

(viii) M/s Scientific Instrument Stores (Geography Section), J-355, New Rajinder Nagar, N. Delhi.

(ix) M/s Bharat Educational Stores, Chippi Tank, Meerut.

(x) Monkhouse and Wilkinson : Maps and Diagrams

(xi) M/s Chatursain & Sons, Suppliers and Manufacturers of Surveying Instruments, Roorkee (U.P.).

(xii) Director General, Dept. of Meteorology, Govt. of India, Lodi Road, New Delhi.

S.C.E.R.T., West Bengal
Library
Calcutta
25/3, B. C. Road

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